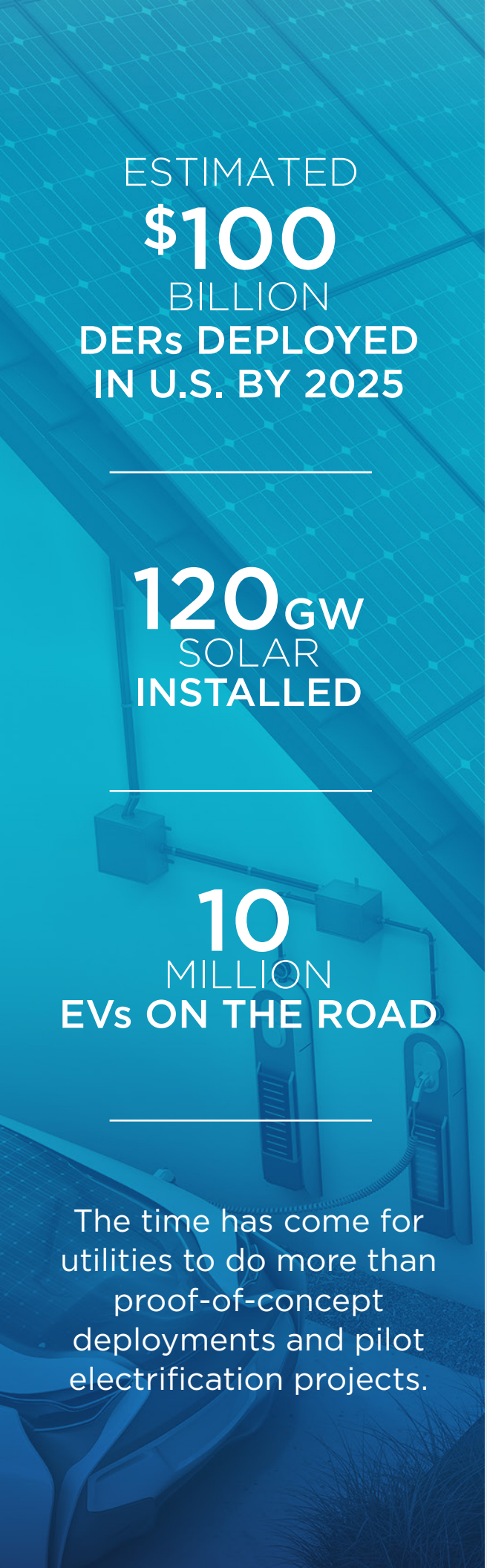
NAVIGATING THE DISTRIBUTED ENERGY RESOURCES REVOLUTION:

A PLAYBOOK

TO GUIDE GRID MODERNIZATION AND FERC 2222 COMPLIANCE

bidgely



ESTIMATED
$100
BILLION
DERs DEPLOYED IN U.S. BY 2025

120 GW
SOLAR
INSTALLED

10
MILLION
EVs ON THE ROAD

The time has come for utilities to do more than proof-of-concept deployments and pilot electrification projects.

Over the past decade, warnings about the impact of solar and energy storage on the utility industry have grown louder: DERs are coming! Utilities need to prepare! The truth is, widespread **distributed energy resource (DER)** adoption isn't looming on some distant horizon. It is already here.

The U.S. Department of Energy estimates that there will be in excess of **$110 billion** in DERs deployed nationwide by 2025, not including the billions in infrastructure spending that will also be required to integrate distributed resources with the grid. Solar has topped **120 GW** installed capacity in the U.S., of which **45 percent is behind-the-meter**. Nearly **12 GW** of battery storage is on the grid, and more than 80 percent of that total has been deployed since 2020. There are currently **10 million** electric vehicles (EVs) on the road today, with an expected **145 million** on the road by 2030.

At the same time, the Federal Energy Regulatory Commission (FERC) is leveling the economic playing field between solar, battery storage, EVs, smart energy devices, and other DERs. Approved in September 2020, FERC Order 2222 is becoming a reality for state regulatory agencies, independent system operators (ISOs) and regional transmission organizations (RTOs), which must develop plans to give DERs access to wholesale energy markets.

Many utilities are making strides in small-scale DER integration, and while efforts like these are beneficial, the time has come for utilities to do more than proof-of-concept deployments and pilot electrification projects. The longer utilities wait to engage DERs at an enterprise level, the more difficult and expensive it will be to coordinate and manage rapid DER expansion on their grids.

DER deployments will only accelerate as cost of ownership continues to fall and wholesale markets unlock additional benefits, whether utilities choose to take an active role or not.

The goal of this playbook is to help energy providers successfully navigate — and more importantly benefit from — the DER revolution.

- **Step 1:** Locate and Analyze DERs on your grid: Penetration, Location, Capacity, Activity
- **Step 2:** Get in Front of Wholesale Energy Markets Opening to DERs
- **Step 3:** Update Business Models to Realign Resource Planning

STEP 1: LOCATE AND ANALYZE DERs ON YOUR GRID: PENETRATION, LOCATION, CAPACITY, ACTIVITY

Achieving DER goals is only possible with clear visibility into grid hosting capacity and customer demand across all rate classes — including the characteristics of end-use behavior that make up that demand. Specifically, energy providers need to know where DERs are located on the grid, their size, and how they're being operated — preferably on a real-time or near real-time basis. That insight then enables planning to scale DERs and manage their use with respect to a clear and ever-evolving snapshot of what the need is and how it changes over time.

ACTION STEPS

Collect behind-the-meter demand data, inclusive of DER load curves

Identify DERs deployment patterns and growth trends

EV Charger:
Type: L2
Usage: 6.6kW
Behavior: Charges 6-9:00pm

Solar Panels:
Size: 4.4kW system
Contract: net-metering

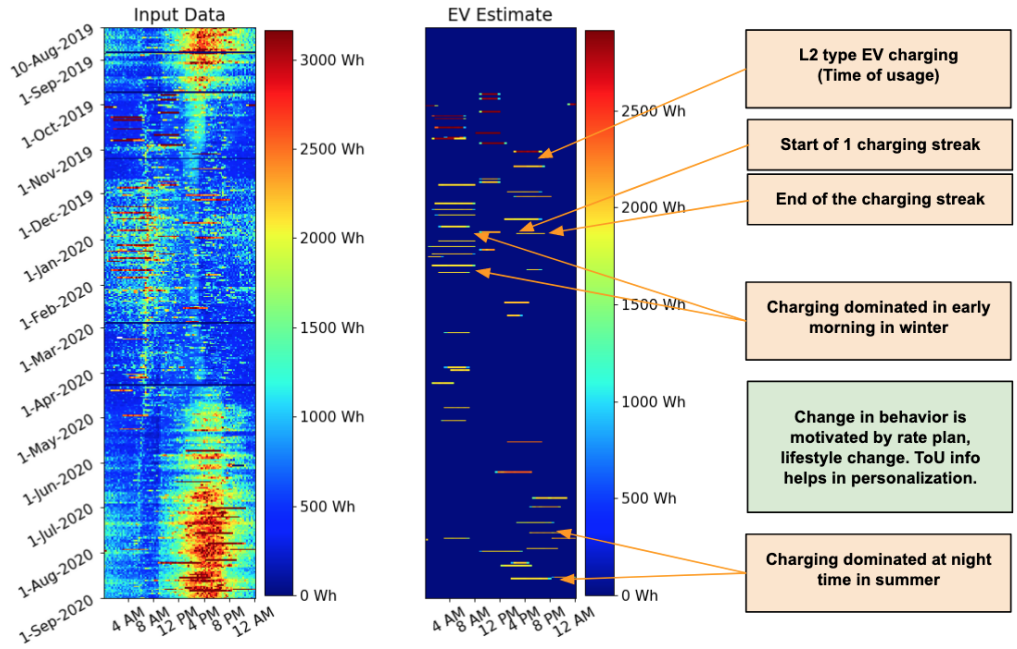
GETTING STARTED

COLLECT BEHIND-THE-METER DEMAND DATA INCLUSIVE OF DER LOAD CURVES

Advanced metering infrastructure (AMI) data enables energy providers to disaggregate customer energy use data to detect existing DERs on the grid. The goal should be as near a real-time understanding of energy usage and behavior as meter communication intervals will allow. For many this can be accomplished via existing 5/15/60 min interval data reads from their AMI systems. If a utility has yet to deploy (AMI), the first step on the DER journey must be to invest in it.

Granular, disaggregated demand data provides a view into the physical realities behind overall demand. This allows for a more comprehensive and dynamic DER deployment strategy that maps to satisfy locational or system-wide constraints.

Take EV detection for example. Specialized disaggregation tools can detect Level 1 and Level 2 EV charging and reveal essential insights from within each customer's total raw energy consumption profile, as shown below.



With the industry's most sophisticated EV disaggregation technology, Bidgely is able to identify charger types, charger amplitude, hours when EV charging occurs, if charging is occurring on a schedule, and total categorical EV consumption.

Similarly, identifying which customers have DER rooftop solar systems, along with the size of the array and its generation on a daily and seasonal basis empowers utilities with much more than a single data point. Through AMI data capture, it is possible to learn how their net generation is moving onto and off of the grid and understand the characteristics of their residual behind the meter demand, such as HVAC use, water heating and electric vehicle charging. Each customer becomes more valuable to the utility and grid by evaluating customer energy interactions holistically, rather than as a singular ownership data point.

IDENTIFY DER PATTERNS AND TRENDS

Combining EV and solar disaggregation allows energy providers to better analyze the complexity associated with multiple behind-the-meter energy resource scenarios. Predictive AI allows utilities to identify where DERs are being used as export technologies or load control/shifting, and to coordinate that interplay to maximize the overall benefits to customers and the grid.

Smart meter detection insights also serve as powerful inputs for grid operations. For example, accurate behind-the-meter DER data at the household level can be aggregated to project impacts on an individual feeder basis, and further up to grid-level analysis.

For electric vehicles, utilities are able to see the total charging consumption and EV load by region, zip code, substation or feeder; the percentage of Level 1 vs. Level 2 chargers; EV load forecasts; percentage of on- vs. off-peak charging; specific geographies with the highest charging; and more.

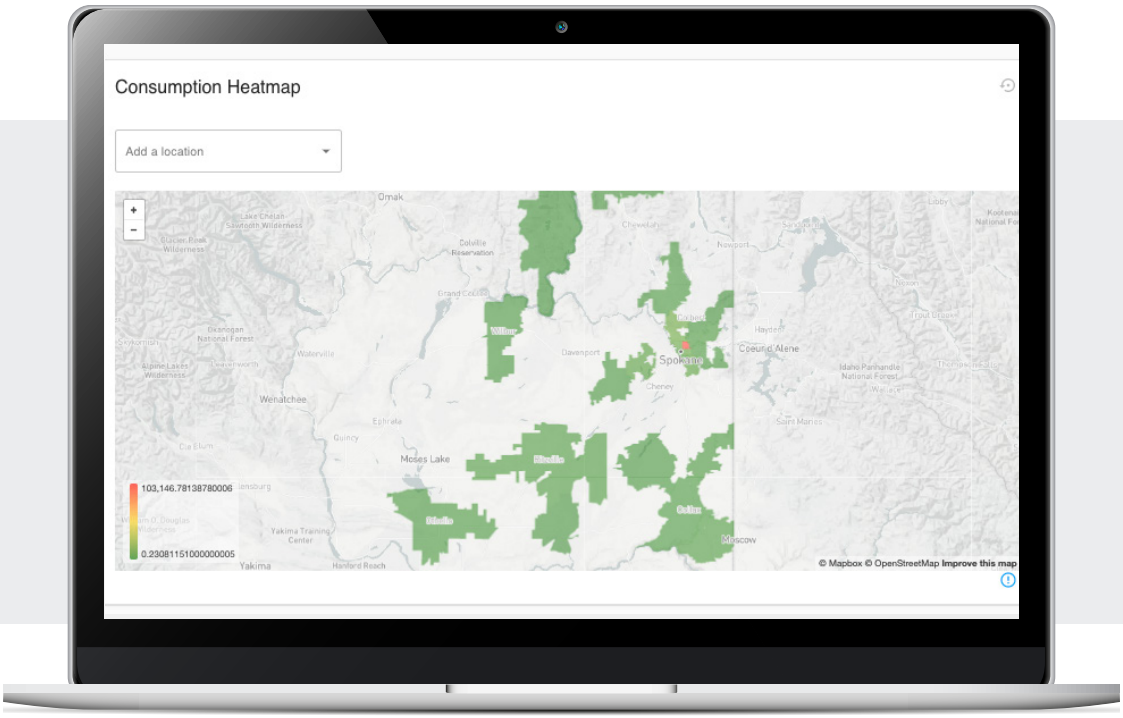
FOR ELECTRIC VEHICLES, UTILITIES ARE ABLE TO SEE:

TOTAL CHARGING CONSUMPTION

EV LOAD BY REGION, ZIPCODE, SUBSTATION OR FEEDER

PERCENTAGE OF LEVEL 1 VS. LEVEL 2 CHARGERS

EV LOAD FORCASTS (PERCENTAGE OF ON- VS. OFF-PEAK CHARGING)



Or, taken with a high fidelity profile of all grid locations that have distributed solar, it is possible to determine likely daily and seasonal generation to inform more accurate grid planning.

When evaluating DER trends, it's also important to take into account the advancement of the prosumer movement. The purchase of an EV is likely to lead to the installation of solar which is in turn likely to lead to the installation of energy storage. Household energy use data helps pinpoint where prosumer trends are most likely to unfold.

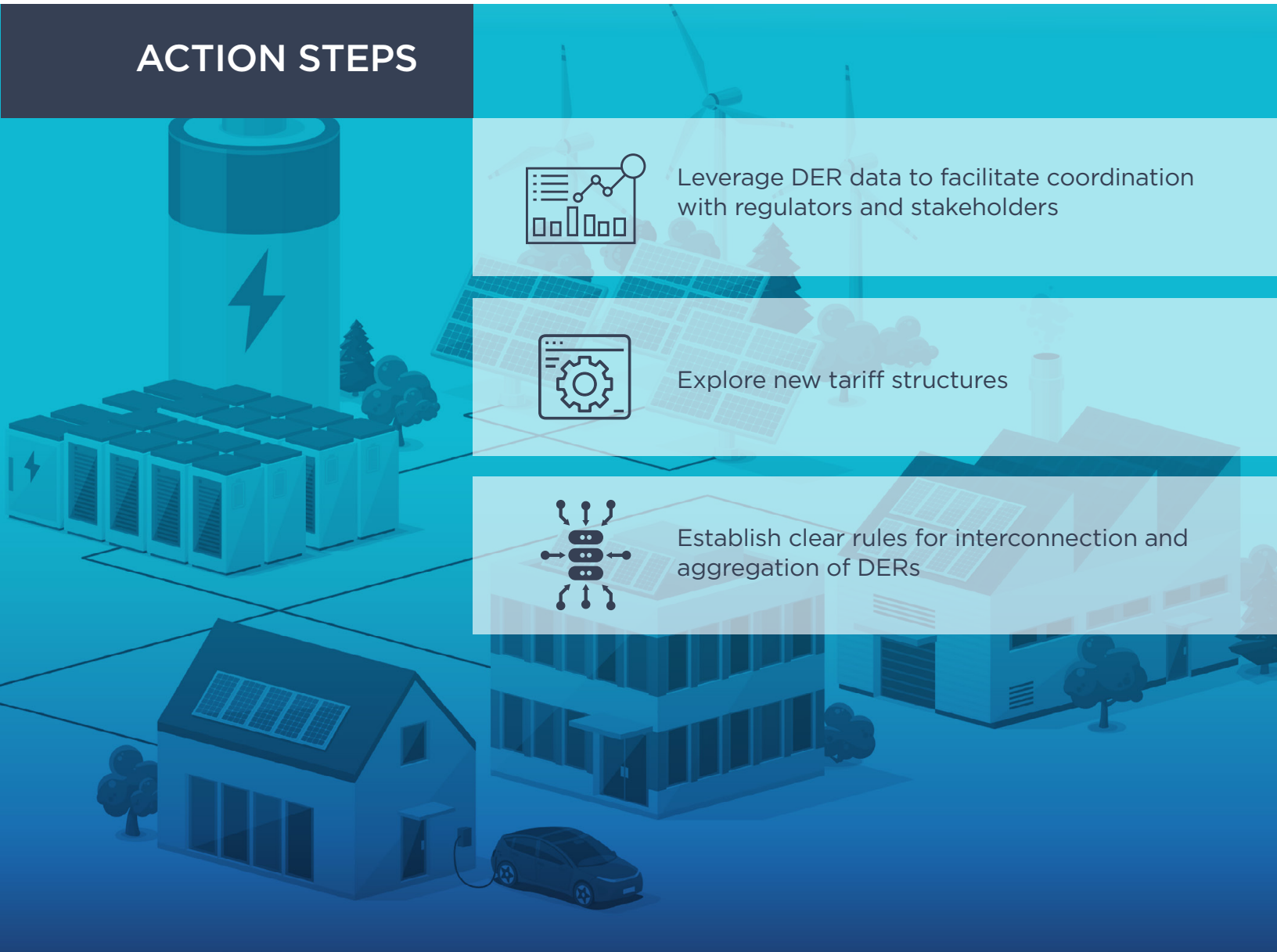
STEP 2: GET IN FRONT OF WHOLESALE ENERGY MARKETS OPENING TO DERs

With wholesale markets set to open to DERs as early as this summer, and third-party aggregators already on the scene signing up utility customers into their own wholesale programs, there is an urgent need right now for utilities to begin preparing.

It's possible that a utility that fails to fully engage in this opportunity might one day have to buy back wholesale power aggregated from its own customers.

It's not hard to imagine a scenario where customers are participating in a retail demand response program run by their utility. The customers are shifting load with a mixture of onsite generation and battery storage. An aggregator comes to those customers and signs them up for a wholesale program through which the aggregator will bid the same resource into spot and day-ahead markets and offer the customers a profit share arrangement. When there's a high-load day that falls outside the utility's callable event schedule, the utility has to go to the spot market to meet their demand, where the aggregator will be bidding their resource.

ACTION STEPS



- Leverage DER data to facilitate coordination with regulators and stakeholders
- Explore new tariff structures
- Establish clear rules for interconnection and aggregation of DERs

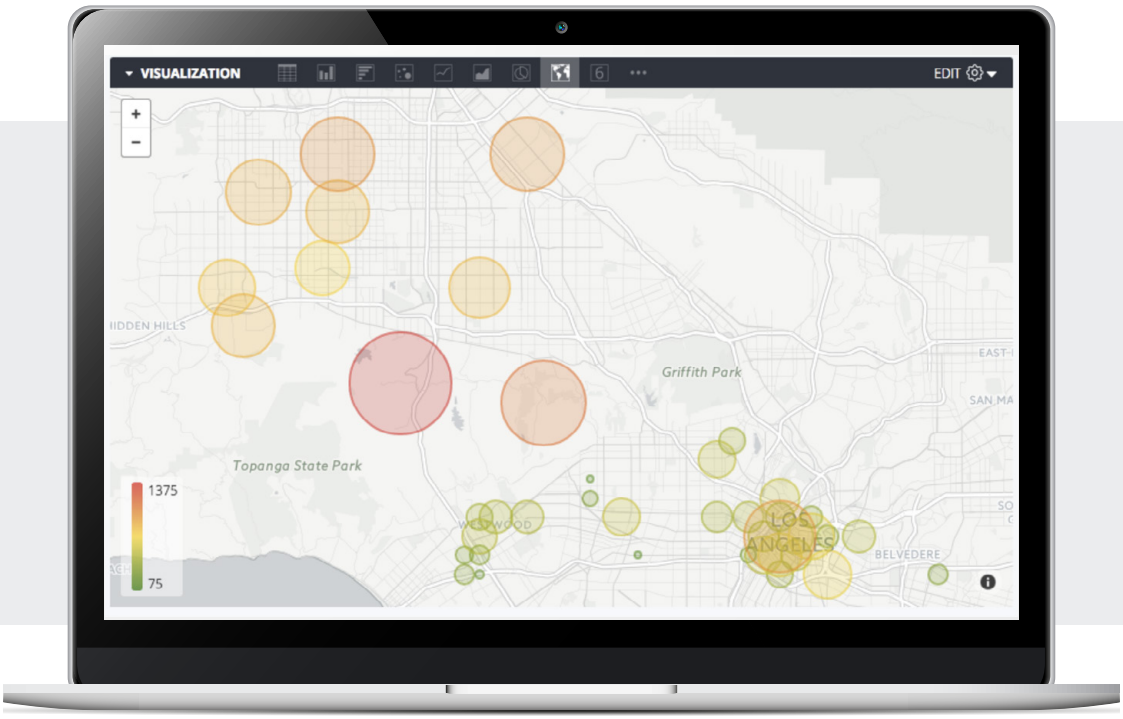
GETTING STARTED

LEVERAGE DER DATA TO FACILITATE COORDINATION WITH REGULATORS AND STAKEHOLDERS

Coordination using a Single Source of Truth

FERC Order 2222 requires extensive coordination between distribution utilities, RTOs/ISOs, aggregators, and state regulators in order to streamline the integration of DERs into wholesale markets.

Near-real-time DER usage behavior, pattern and trend data is an invaluable foundational resource for all stakeholders and can serve as a single source of truth that ensures all parties are on the same page.



Capitalization of “D”ERs

The “D” in DERs throws doubt on the efficacy of traditional top-down planning and procurement models and injects uncertainty into forecasting and rate design in the eyes of many regulators. Granular demand data and predictive analytics can tell the story of ”why” this specific size, configuration, and location of DERs investments is necessary and appropriate.

EXPLORE NEW TARIFF STRUCTURES

Utilities from New Hampshire to Michigan to California are already exploring new tariff structures and marginal cost algorithms to accommodate increasing shares of marginal resources. Beyond relevance to their customers and the revenue implications, if they want to remain viable as investment vehicles for their shareholders in the face of decades of stagnant load growth, they need to rapidly adapt to the new DER reality.

In the FERC 2222 environment, it is essential to equitably allocate costs between retail customers, DER owners, and aggregators.

More granular and nuanced rate structures are required in order to balance cost recovery, maintaining a safe, reliable grid system, and appropriately compensating DER providers for their resources. Creating responsive and hyper-targeted tariff structures requires AMI-data-driven DER insights to avoid a mismatch between rates and cost to serve.

In addition, just as it's important to make the case to regulators about the prudence of investments in DERs, it is also important for utilities to be able to anticipate and prioritize the financial impacts of those investments. Both retail program and wholesale market impacts to marginal supply costs and O&M costs, input fuels, and more can be incorporated into bottom-line financials with the help of disaggregated load data and predictive AI.

ESTABLISH CLEAR RULES FOR INTERCONNECTION AND AGGREGATION OF DERs

It's important to remember that existing rules for interconnections are sufficient for most DERs. But in cases of customer-site DERs or aggregated DERs, more information and additional performance guarantees will be required to ensure that those resources are optimized and meeting their obligations. There are myriad models available to develop these rules from, and many RTOs and state regulatory agencies are already working on updating their rules to accommodate these new types of resources.

STEP 3: UPDATE BUSINESS MODELS TO REALIGN RESOURCE PLANNING

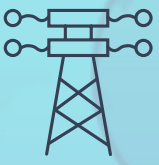
Simultaneously transitioning to a more agile decentralized grid, ensuring continued reliability, and facilitating an expanded wholesale marketplace will require new systems, processes and technologies.

ACTION STEPS

Engage with a larger partner ecosystem and leverage DERs data to anchor data infrastructure and analytics capabilities

Identify DERs deployment patterns and growth trends to drive grid infrastructure and DER strategy and investment decisions

Rethink demand response



Accelerate grid modernization timelines

GETTING STARTED

ENGAGE WITH A LARGER PARTNER ECOSYSTEM

Utilities need myriad partners in the DER technology, controls and management spaces.

Energy providers will need to manage DER interconnections and aggregations on their grids, which means utilities will need to establish clear protocols for siting DERs, especially those in aggregations. They will also need physical hardware as well as controls, sensors, and management platforms to optimize grid dynamics.

Energy providers will also need visibility into how DERs are being utilized, both by aggregators and by customers. These insights will help utilities closely match resources with their optimal use cases, which will be crucial to maximize all DER value streams.

In the face of this complexity, utilities should seek flexible, scalable data and analytics solutions with broad application. If utilities intend to integrate DERs in a vast number of configurations and locations on the distribution system, a piecemeal approach with siloed solutions built for each component will not work.

RETHINK DEMAND RESPONSE

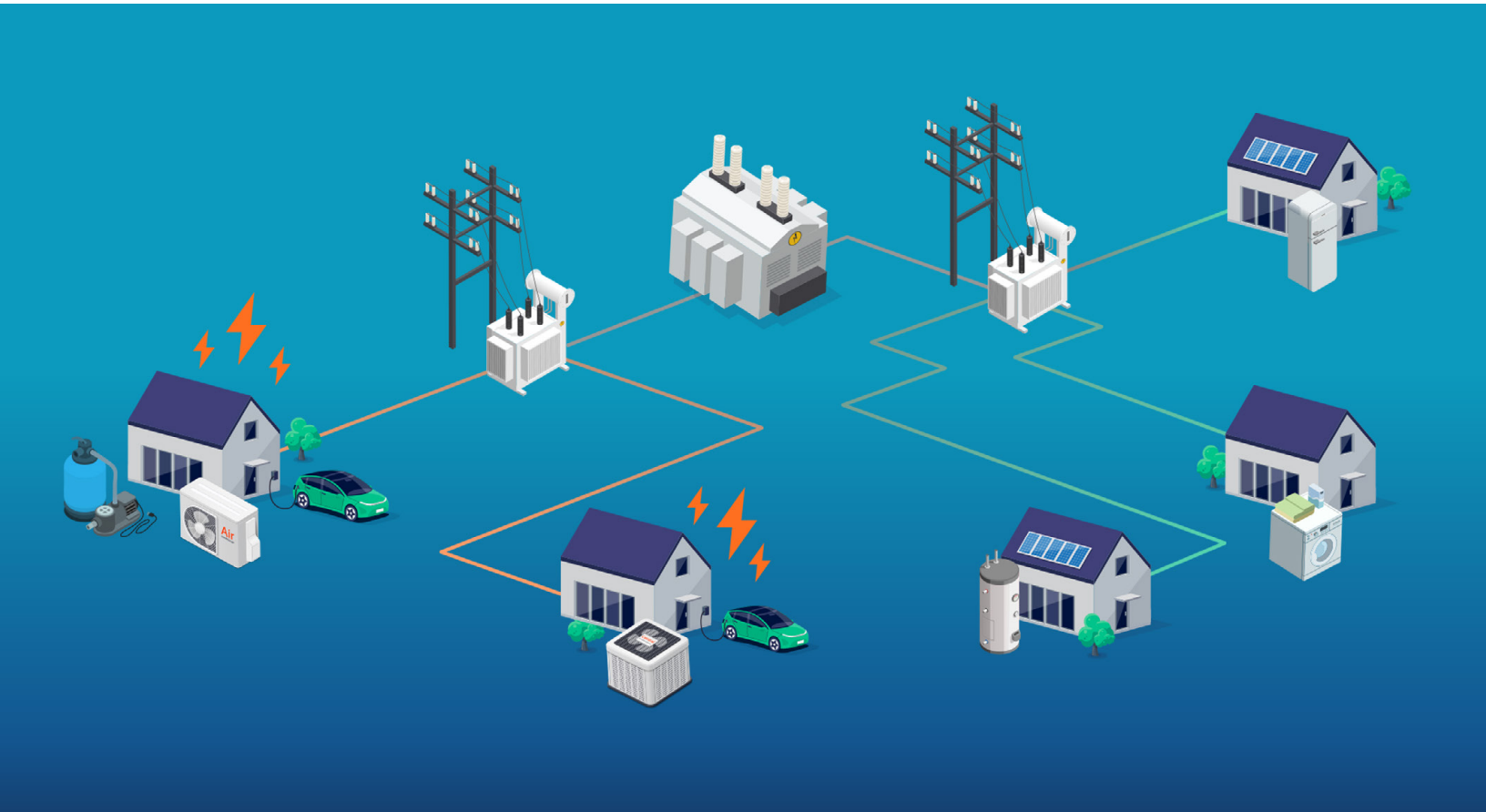
Current demand response models do not take into account the range of services that DERs are capable of providing — including grid supply. Though utilities should leverage the processes already in place for demand response forecasting, monitoring, and M&V as a first step in developing new DER processes, future-ready DER behavioral programs should be based on equipment signature, time of use and efficiency.

For example, legacy demand-side management approaches might offer all customers within a congested area an incentive to shift their EV load. But not every customer in that area will have an EV, and among those who do, it is likely that many are already charging off-peak (or at public stations/work). Data analytics allows energy marketers to pinpoint which customers have an EV and when they are charging. With those insights, energy providers can focus demand response programs to incentivize these customers in proportion to their load contribution to realize greater grid benefit.

In addition, the mandate of demand response programs must evolve from a unilateral order to reduce or shift load to a two-way provision of flexible load and supply. A more agile and personalized approach to customer engagement is increasingly important to influence where and when consumers use energy.

Analytics-driven demand response programs have the power to alleviate congestion on transformers and substations in a more agile and scalable way by shifting the load of specific homes or buildings at specific times of day and by targeting the highest propensity end-uses within a given load profile.

AMI-driven DER insights can also help energy providers build collaborative relationships with customers who are positioned to participate in grid supply when necessary — such as managed charging for EV owners or cooling demand-shift which capitalizes on mid-day solar generation. This type of engagement can serve as a hedge against the scenario in which a utility finds itself buying spot market power aggregated from its own customers.



ACCELERATE GRID MODERNIZATION TIMELINES

DERs have near infinite scalability and agility, which means traditional, centralized, top-down resource planning and dispatch is no longer adequate to grapple with the complexity of DERs, nor is it appropriate to capture their full grid benefits.

Current "business as usual" approaches could take 20-plus years to fully modernize the grid and achieve beneficial electrification and climate goals. This however, directly conflicts with the 10-year net zero timeline to stave off the worst effects of climate change. While FERC's Order 2222 presents an incredibly aspirational shift in the way utilities do business and it would be unrealistic to expect utilities to change operating models overnight, it is very clear utilities need to act with urgency.

DER deployment patterns and growth trends are a reliable metric that utilities can use to drive grid infrastructure and DER strategy and investment decisions.

Third-party aggregators and natural market forces will continue to push DERs onto the grid, and the window of opportunity to engage with DERs in a meaningful way will close.

Once a utility has leveraged data to establish a baseline and plot a roadmap, it is possible to scale DER investments very quickly. Ultimately, utilities can shrink their modernization timelines to under 10 years, if they are committed to embracing a bolder, more decisive, data-enabled approach. There is no doubt that the utilities who adapt today will be the ones reaping the full benefits of the modernized grid of tomorrow.

THE DER REVOLUTION REQUIRES A FUTURE-READY APPROACH

Energy customers are deploying DERs at an accelerating pace, and FERC 2222 is unlocking new revenue streams which many third parties will be vying to capture by engaging customers in aggregation and integration programs.

Even in the face of this rapid change, energy providers maintain two distinct advantages: 1) unreplicable access to robust behind-the-meter DER-related data; and 2) a brand customers trust to deliver reliable power and energy-related services. Customers would rather engage with the energy providers they know. Utilities only need to provide them with the opportunity to do so.

That's why immediately harnessing DER data, cataloging and integrating the variety of energy services DERs provide, and scaling and optimizing DERs across the grid is essential. Behind-the-meter, demand-side data has the power to enhance outcomes and increase the value of distributed resources utility-wide, but the time to act is now.

For more information about how Bidgely's Analytics Workbench enterprise data platform and DER solutions help energy providers successfully navigate and benefit from the DER revolution, visit

www.bidgely.com/solutions/enterprise-analytics-workbench

bidgely